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ABSTRACT

Simple linear correlations, partial correlations, and moderator variable techniques were utilized to investigate the effects of school district size on school district level expenditure and composite achievement. Expenditure data were assembled on more than 500 Michigan districts and achievement data collected on over 300,000 pupils at the fourth and seventh grade levels. Overall correlations accounted for only two percent of the variance. Partial correlations yielded a slight increase in the coefficients, and using size as a moderator variable scale was promising. The results are discussed in terms of their impact for educational decisionmakers. (Author)

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A STUDY OF THE RELATIONSHIPS AMONG DISTRICT SIZE, EXPENDITURE LEVEL AND COMPOSITE ACHIEVEMENT

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A long history of studies in educational finance has indicated a positive relationship between school or school district expenditure level and quality of education. These studies, commonly called cost-quality studies, have used many different measures of "quality" but nearly all have indicated this positive relationship. The following should serve as examples of these studies.

Mort and Cornell (1941) in a study of thirty-six Pennsylvania school systems investigated the relationship between expenditure level and the tendency of school systems to engage in new educational practices. A correlation of .587 was reported between expenditure and the adoption of new practices. When school district size was held constant, the correlation decreased to .520. Of sixty-seven factors studied, none was more highly associated with this measure of quality than expenditure, though five others were nearly as important.

McLure (1948) in an analysis of returns for money spent in Mississippi, found that the quality of education provided in school systems where expenditures were low was far less satisfactory than in systems where expenditure levels were above the national average. The results of his study, indicate, however, that even in the lowest ranges of expenditures, citizens can expect improvement in educational returns when they spend more money for education.

Woollatt (1949) investigated the cost-quality relationship in high expenditure metropolitan New York schools. The results indicated that there was a

direct positive relationship between expenditure per pupil and each of four factors of quality and between expenditure and a composite of those four factors. The correlation between the overall quality score and expenditure level was .59.

Smith (1954) studied 298 rural consolidated schools in New York with relatively similar expenditures per pupil. The correlation between expenditure and observed quality in these schools was .35. Smith suggested that the small amount of variation in school expenditures could be expected to reduce the relationship. He concluded that considering the narrow expenditure range and the many common community factors of these schools, the derived relationship was similar to previous studies.

Bloom (1956) reported results gathered during two nationwide studies which were aimed primarily at developing normative data for the tests of General Educational Development (G.E.D.). The G.E.D. tests were originally developed by the United States Armed Forces Institute for the classification and aid in training of members of the armed services who wished to continue their education while on military duty. In order to provide normative data, an extensive testing program was conducted by E. F. Lindquist in 1943. Bloom followed the same procedure in 1955, and administered G.E.D. tests to 38,773 seniors in 834 high schools in all states. While Bloom's study was primarily for normative development, his data suggested that financial support for both formal education (the schools) and informal education (the public library) was related to quality of education of high school seniors as measured by the G.E.D. tests in the several states.

Bloom and Statler (1957) published a more thorough analysis of the information collected during the 1943 and 1955 G.E.D. testing programs. Among their observations was that the state level of expenditure per pupil was the most highly correlated factor with achievement.

Jantze (1961) conducted a study of forty-six secondary schools in Nebraska. His results indicated that scholastic achievement as measured by the Iowa Tests of Educational Development was greatest when per pupil expenditures were greatest. Exceptions were where extremely small enrollment resulted in higher per pupil expenditure apparently caused by diseconomies of scale.

Simpson (1961) examined the relationship among reported expenditures and programs in sixty-seven metropolitan school districts located in Macomb, Oakland, and Wayne Counties, Michigan. He concluded that instructional expenditure level per pupil (the instructional account) was the most important influence upon educational quality as measured by staffing adequacy and several other variables. Expenditure level accounted for 40 percent of the total variation measured among the districts.

Rajpal (1967) classified 324 public high schools in Iowa according to enrollment. Significant correlations were obtained in each of the eight size categories between K-12 instructional expenditure per pupil and composite scores on the Iowa Tests of Educational Development, and in seven of the eight groups between K-12 current expenditure and the composite achievement scores.

Thomas (1968) in a study conducted in Michigan found extreme differences among school districts of the state in the nature and components of educational offerings. He concluded that there is a direct relationship between educational expenditures and the nature of educational opportunities open to Michigan students.

Mort, Reusser, and Polley (1960, 81), after reviewing twenty-six cost quality studies, summarized the findings as follows:

> 1. Regardless of the method of measuring quality, a relatively strong relationship holds through all levels of expenditure as yet experienced in public education, from the lowest as exemplified by Mississippi, through the middle group as exemplified by West Virginia, Maine, Rhode Island, Illinois, and Pennsylvania, to the highest as exemplified by New York and New Jersey.

2. Even the highest expenditure public schools do not begin to approach the point, if there is one, where the relationship drops off, and no school is so poorly supported as to be lacking in important values.

3. The relationship appears to be an accelerating one. Those who spend more tend to add to the range of education, on the one hand, and on the other, to do a better job of focusing on the needs of children and young people throughout the range of ability.

In view of the results of previous studies, the data collected by the Michigan Educational Assessment Program (MEAP) are particularly interesting because the correlations between district level expenditure and composite achievement, while statistically significant, are low.

The investigators hypothesized that school district size affected the correlation coefficients. This study explored the effect of school district size on the relationship between district level expenditure per pupil and composite achievement.

METHOD

Subjects

Subjects were Michigan public school districts which provided complete data at the fourth or seventh grades for use in the 1970-71 MEAP. Complete data were obtained on 504 districts at grade four. These variables included district means on five cognitive measures plus nine measures of district financial and human resource inputs. Districts whose mean test scores were based upon fewer than five pupils were excluded as potentially unrepresentative of the district. The number of districts with complete data for grade seven was 502 with the same conventions applied for inclusion. These districts represent a sizable percentage of the 530 districts in Michigan that were organized to operate programs in kindergarten through grade twelve.

Measures

K-12 Instructional Expense Per Pupil

K-12 instructional expense per pupil was used as the measure of district expenditure level. The information to compute this measure was taken from records reported by local districts for the fiscal year which ended June 30, 1970. The total K-12 instructional expense included expenditures for salaries and supplies connected with elementary education, secondary education, special education, summer school, and adult education. In order to obtain a value for instructional expense per pupil, total K-12 instructional expense for each district was divided by the total number of pupils enrolled in the district as reported in the 1969-70 Fourth Friday Membership and Personnel Report.

Basic Skills Composite Achievement Mean

Mean district composite achievement scores were computed by averaging the composite achievement scores for all pupils tested at grades four and seven on the 1970-71 MEAP battery. The composite score was obtained for each pupil by averaging the individuals' standard scores on the reading, mechanics of written English, and mathematics tests. The test scores were averaged in such a way that each score contributed equally to the average. District means were computed separately for grades four and seven.

District Size

District state aid membership, defined as the total number of pupils (full time equivalent) enrolled in the district at the close of school on the fourth Friday following Labor Day of the school year, was used as the measure of district size. It was first reported as a variable in the Michigan Educational Assessment Program in the 1970-71 testing year. However, these figures reflected the 1969-70 enrollment of each district.

Procedures

Data for this study were developed from three sources: (1) The expenditure measure was derived from Annual School District Financial Reports submitted by each local district to the Michigan Department of Education; (2) the annual Fourth Friday Membership and Personnel Reports submitted by each local district to the Michigan Department of Education were the sources of the state aid membership information used to convert total expenditures to expenditures per pupil and to categorize districts on size for the moderator variable analysis; and (3) the Michigan Educational Assessment Program (MEAP) was the source of the achievement data.

The annual financial reports and the membership and personnel reports were compiled by the Michigan Department of Education to fulfill statutory requirements. This information was combined with achievement and other data collected with the assistance of local districts about pupils and aggregated at the school and district levels. The 1970-71 assessment records contained financial information reflecting expenditures per pupil for 1969-70, the most recent complete fiscal year, combined with achievement test results collected during 1970-71.

Before discussing the correlational techniques used in the study, a brief explanation should be made regarding moderator variables. Saunders (1956) developed a moderated regression model and originated the term moderator variable. Ghiselli (1956, 1960, 1968) brought attention to the practical utility of moderator variable scales. Ghiselli's method of developing moderator variable scales makes use of the differences between z scores in order to classify differentially predictable subgroups, i.e., groups with small algebraic differences

between z scores yield more predictable subgroups. Schooley (1968, 1971) and others have extended the moderator variable concept to include the a priori identification of various subgroup categories which would increase the accuracy of prediction within one or more of the subgroups as compared to prediction for the entire group.

Correlation matrices, both linear and partial, were prepared for both grade levels. In the hope of understanding more fully the relationship between instructional expenditure and achievement, a moderator variable procedure was used on the data by computing correlations separately for subgroups of districts similar in size according to their 1969-70 membership as determined for state aid purposes. Three groups were formed as follows: Group I, districts having memberships of 10,000 or more pupils; Group II, districts having from 2,000 to 9,999 pupils; and Group III, districts having fewer than 2,000 pupils.

Correlation matrices were computed for each of the three groups using grade four achievement data and separate correlation matrices using grade seven achievement data.

RESULTS

The overall linear correlation coefficients between expenditure level and achievement were significant ($p \leq .05$) but accounted for only two percent of the common variance. In an attempt to "partial out" the overall effects of size, partial correlations were computed holding size constant. The partial correlation coefficients were larger than the overall linear coefficients but still accounted for at most three percent of the variance. Table 1 presents the linear and partial correlations.

TABLE 1

Linear and Partial (holding size constant) Correlation Coefficients Between K-12 Instructional Expense Per Pupil and Composite Achievement at Grades 4 and 7 for Michigan School Districts

Composite Achievement District Means	N	Linear Correlation	Partial Correlation
Grade Four	504	.15*	.17
Grade Seven	502	.15*	.18

* $p \leq .05$

Finally, district size was used as a moderator variable scale by computing linear correlation coefficients separately for groups of districts similar in size. Table 2 presents the linear correlations between K-12 instructional expense per pupil and district composite achievement using district size as a moderator variable.

TABLE 2

The Correlation Coefficients Between K-12 Instructional Expense Per Pupil and Composite Achievement Using District Size as a Moderator Variable

Grade 4

Size of District	Number of Districts	Correlation Coefficient(r)
I (>10,000)	33	.50*
II (2,000-9,999)	224	.13
III (<2,000)	257	.19*

Grade 7

I (>10,000)	33	.54*
II (2,000-9,999)	224	.07
III (<2,000)	255	.24*

*$p \leq .05$

The analysis indicates that at both the fourth and seventh grade levels the correlation between K-12 instructional expense per pupil and district composite achievement is significant in Group I (districts having membership greater than 10,000), and in Group III (districts having membership below 2,000). In Group II (districts having membership of 2,000-9,999) the correlation between K-12 instructional expense and composite achievement is not significant for either grade level.

Of particular interest are the differences among the correlation coefficients between groups. The Group I correlations are significantly higher than the correlations of the other two groups at both the fourth and seventh grade levels. At the fourth grade levels Groups II and III, do not vary significantly from each other. However, at the seventh grade levels Group II is significantly lower than Group III.

DISCUSSION

The results of this study indicate that there is a higher relationship between K-12 instructional expenditure and district composite achievement in large districts than in smaller districts, and that this relationship is significantly different than what is found in the other groups of districts in this study. Furthermore, districts between 2,000 and 9,999 membership do not show a significant relationship between expenditure and achievement.

However, the relationship between expenditure and achievement can not be examined in isolation. Even though there is low, non-significant relationship between expenditure and achievement in Group II, it may be observed from Table 3 that this group has higher composite achievement scores and lower K-12 instructional expense than Group I districts.

TABLE 3

Means ($\bar{x}$) and Standard Deviations (S.D.) by District Group for K-12 Instructional Expense Per Pupil and Composite Achievement

	K-12 Instructional Expense Per Pupil		Composite Achievement	
	$\bar{x}$	S.D.	$\bar{x}$	S.D.
Grade 4				
Group I	$568	$78	50.5	3.17
Group II	485	79	51.1	2.31
Group III	442	58	51.0	2.56
Grade 7				
Group I	568	78	50.5	3.17
Group II	485	79	51.1	2.46
Group III	441	57	50.9	2.27

The investigators conclude that money does make a difference in achievement, particularly in large districts. That is, an increase in expenditure seems to be associated with an increase in achievement. However, the results of this study provide clear evidence that money is not the only indicator of quality in any size district. Even in the large districts only 25 percent of the variation in achievement scores is accounted for by K-12 instructional expenditure per pupil, while in smaller districts much less variance is accounted for while achievement results are higher.

In using size as a moderator variable scale, the investigators hypothesized that for certain districts, expenditures per pupil would be more highly related to district composite achievement than in others. The results of the study support

this hypothesis. There may, indeed, be an optimal district size in which this relationship can be maximized. However, the results of this study do not clearly indicate what this size may be. Further studies should be made in this regard.

Furthermore, this study shows a wide range in expenditures per pupil among the district size groups. The authors support the current movement toward equal educational opportunity for students through equalized financing for education. When this goal of equal financial opportunity is reached, studies of this type may no longer be necessary. The question will then be--given equal financing of education, what services will best meet the needs of children and youth?

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